SORTING APPARATUSES AND SORTING METHODS

TECHNICAL FIELD

The present invention relates to sorting apparatuses and sorting methods.

BACKGROUND OF THE INVENTION

Vibratory conveying systems are known in the art. A vibratory drive is connected to the conveying frame or bed in exemplary conventional vibratory conveying systems. Some experimentation has been conducted wherein the vibratory device is connected to a support frame and the support frame is excited or primarily vibrated with the vibration being transferred through springs indirectly to the conveying member or bed. Exemplary conventional systems are described in U.S. Pat. Nos. 2,876,891, 2,951,581 and 3,380,572, which are incorporated herein by reference.

Newer designs have provided a system wherein the vibration amplitude of the excited frame approaches zero while the conveyor bed or member is vibrated at its natural frequency of maximum amplitude. The generally recognized advantages of such systems over conventional direct vibratory conveyors are that it is possible under some conditions to transfer less vibration into the floor or ceiling supports and to provide a conveyor that is considerably less massive than direct drive vibrating systems.

U.S. Pat. No. 4,313,535, incorporated herein by reference, teaches an improved excited frame vibratory conveying apparatus for moving particulate material. Plural supports or springs space a conveyor member from the excited frame. The device of the '535 patent teaches a vibratory drive means mounted to an elongated conveying frame for vibrating the elongated conveying frame in an intended direction for conveying particulate material. The drive means produces a vibratory motion along a linear line of force. The device of the '535 patent provides a configuration for operation over a relatively large range of loads without any appreciable vibration of the excited frame.

Such systems are preferably configured for use with various types of particulate material. For example, one conveying apparatus can be configured to convey one type of material in one application and another similar conveying apparatus can be configured to convey another material in another application. It may be desired to vary the amount of vibration of the conveyor member corresponding to the type of particulate matter being conveyed. In particular, it may be necessary to increase or decrease the amplitude of vibration of the conveyor member corresponding to a particular application.

While the effectiveness of such systems to convey particulate material has been clearly demonstrated, there may exist a desire for some applications to separate or sort the particulate material or articles. For example, the articles may comprise desirable as well as undesirable product. Accordingly, in some applications it may be preferable to separate the material for further processing or packaging. Thus, there exists a need to provide a system which can be utilized to effectively sort the material or articles to facilitate processing and overall production.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are described below with reference to the following accompanying drawings.

FIG. **1** is a schematic representation of one embodiment of a sorting apparatus according to one aspect of the present invention.

FIG. **2** is a schematic representation of an exemplary embodiment of a first sorter of the sorting apparatus shown in FIG. **1**.

FIG. **3** is a schematic representation of exemplary embodiments of a stabilization device, second sorter, and take-away device of the sorting apparatus shown in FIG. **1**.

FIG. **4** is a schematic representation illustrating exemplary sorting operations of the second sorter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

This disclosure of the invention is submitted in furtherance of the constitutional purposes of the U.S. Patent Laws "to promote the progress of science and useful arts" (Article 1, Section 8).

According to one aspect of the present invention, a sorting apparatus comprises: an intake section configured to receive plural articles to be sorted; an exhaust section located downstream of the intake section; and an air manifold adjacent the intake section and positioned to emit an air stream in a generally downstream direction and wherein the articles move in a given direction of movement, and the emitted air stream sorts at least some articles from remaining articles and directs the at least some articles in the downstream direction from the intake section to the exhaust section.

According to a second aspect, a sorting apparatus comprises: an is intake section configured to receive plural articles to be sorted; an exhaust section located downstream of the intake section; a first air manifold configured to emit an air stream to sort at least some articles from remaining articles and direct the at least some articles from the intake section to the exhaust section; an intermediate section located downstream of the intake section and upstream of the exhaust section and which is configured to receive the remaining articles; and a second air manifold configured to emit an air stream to sort at least some additional articles from the remaining articles and direct the at least some additional articles from the intermediate section to the exhaust section.

Another aspect of the present invention provides a sorting apparatus comprising: a base member; a sorter housing having an intake section configured to receive plural articles to be sorted; an exhaust section located downstream of the intake section; and an air manifold positioned adjacent the intake section and configured to emit an air stream in a direction substantially parallel to a direction of movement of the articles to sort at least some articles from remaining articles and direct the at least some articles from the intake section to the exhaust section; at least one resilient support coupled intermediate the base member and the sorter housing; and a drive device operable to impart movement to the sorter housing.

According to another aspect, a sorting apparatus comprises: a first sorter configured to receive plural articles to be sorted and define a plurality of discrete courses of travel for the articles, the first sorter having an air manifold configured to emit an air stream intermediate adjacent courses of travel in a generally downstream direction to sort at least some articles according to a first product characteristic from remaining articles and direct the at least some articles intermediate adjacent courses of travel; a stabilization device located downstream of the first sorter and configured